Document made available under the Patent Cooperation Treaty (PCT)

International application number: PCT/US05/007261

International filing date: 07 March 2005 (07.03.2005)

Document type: Certified copy of priority document

Document details: Country/Office: US
Number: 60/550,578
Filing date: 05 March 2004 (05.03.2004)

Date of receipt at the International Bureau: 20 April 2005 (20.04.2005)

Remark: Priority document submitted or transmitted to the International Bureau in compliance with Rule 17.1(a) or (b)

World Intellectual Property Organization (WIPO) - Geneva, Switzerland
Organisation Mondiale de la Propriété Intellectuelle (OMPI) - Genève, Suisse

1307589

THE UNITED STATES OF AMERICA

TO ALL TO WHOM THESE PRESENTS SHALL COME:

UNITED STATES DEPARTMENT OF COMMERCE

United States Patent and Trademark Office

April 12, 2005

THIS IS TO CERTIFY THAT ANNEXED HERETO IS A TRUE COPY FROM THE RECORDS OF THE UNITED STATES PATENT AND TRADEMARK OFFICE OF THOSE PAPERS OF THE BELOW IDENTIFIED PATENT APPLICATION THAT MET THE REQUIREMENTS TO BE GRANTED A FILING DATE.

APPLICATION NUMBER: *60/550,578*
FILING DATE: *March 05, 2004*
RELATED PCT APPLICATION NUMBER: *PCT/US05/07261*

UNITED STATES PATENT AND TRADEMARK OFFICE
DEPARTMENT OF COMMERCE

Certified by

Jon W. Dudas

Under Secretary of Commerce
for Intellectual Property
and Director of the United States
Patent and Trademark Office

-15992 U.S.PTO
030504

22581 U.S.PTO
60/550578
030504

PTO/SB/16 (01-04)
Approved for use through 07/31/2006. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

PROVISIONAL APPLICATION FOR PATENT COVER SHEET

This is a request for filing a PROVISIONAL APPLICATION FOR PATENT under 37 CFR 1.53(c).

Express Mail Label No. ER 715489448 US

INVENTOR(S)		
Given Name (first and middle [if any])	Family Name or Surname	Residence (City and either State or Foreign Country)
DAVID H.	McFADDEN	9 Pine Knoll Road, Lexington MA 02420

Additional inventors are being named on the ______ *separately numbered sheets attached hereto*

TITLE OF THE INVENTION (500 characters max)

SPEED COOKING CONVEYOR OVEN

Direct all correspondence to: **CORRESPONDENCE ADDRESS**

☐ Customer Number:

OR

☑ Firm or Individual Name	David A. Bolton				
Address	1103 Concord Avenue				
Address					
City	Southlake	State	TX	Zip	76092
Country	USA	Telephone	817-821-3956	Fax	817-421-6392

ENCLOSED APPLICATION PARTS ***(check all that apply)***

☑ Specification *Number of Pages* 9

☐ CD(s), Number ______

☑ Drawing(s) *Number of Sheets* 6

☐ Other (specify) ______

☐ Application Data Sheet. See 37 CFR 1.76

METHOD OF PAYMENT OF FILING FEES FOR THIS PROVISIONAL APPLICATION FOR PATENT

☑ Applicant claims small entity status. See 37 CFR 1.27.

☑ A check or money order is enclosed to cover the filing fees.

☐ The Director is herby authorized to charge filing fees or credit any overpayment to Deposit Account Number: ______

☐ Payment by credit card. Form PTO-2038 is attached.

FILING FEE Amount ($): 80.00

The invention was made by an agency of the United States Government or under a contract with an agency of the United States Government.

☑ No.

☐ Yes, the name of the U.S. Government agency and the Government contract number are: ______

Respectfully submitted,

SIGNATURE

Date 5 March 2004

REGISTRATION NO. 41627
(if appropriate)

TYPED or PRINTED NAME David A. Bolton

Docket Number: ______

TELEPHONE 817-821-3956

USE ONLY FOR FILING A PROVISIONAL APPLICATION FOR PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of: **DAVID H. McFADDEN**

Serial Number: **TO BE ASSIGNED**

Filed: **5 March 2004**

For: **SPEED COOKING CONVEYOR OVEN**

TRANSMITTAL

Box: PROVISIONAL PATENT APPLICATION
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

Sir:

Please file the following enclosed documents in the subject application:

1. This Transmittal with Certificate of Express Mail (2) pages;
2. Provisional Application Cover Sheet (1) page
3. Provisional Application (9) Pages;
4. Drawings (6) pages;
5. Assertion of Entitlement to Small Entity Status (2) pages;
6. Certificate of No Foreign Filing (2) pages;
7. Our check in the amount of $80.00 to cover the Provisional Application Filing Fee; and
8. Our return postcard which we would appreciate you date stamping and returning to us.

EXPRESS MAIL NO. ER 715489448 US
I hereby certify that this paper or fee is being deposited with the United States Postal Service as Express Mail "Post Office to Addressee" service under 37 C.F.R. § 1.10 on the date indicated below and is addressed to: Provisional Patent Application Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450.
Date of Deposit: March 5, 2004
By: Rod W. Dalton

Please conduct all correspondence in the above matter with:

David A. Bolton
1103 Concord Avenue
Southlake, Texas 76092
(817) 421-3431 (voice)
(817) 821-3956 (voice
(817) 421-6392 (fax)

Respectfully submitted,

March 5, 2004
Date

David A. Bolton
Reg. No. 41627
1103 Concord Avenue
Southlake, Texas 76092
(817) 821-3956 (voice)

ATTORNEY FOR APPLICANT

Background:

The invention relates to conveyor ovens for rapid cooking (e.g., baking, broiling, 'rethermalization") of food products.

In high volume restaurant operations(e.g., Pizza Hut), deck ovens traditionally used for pizza baking have been successfully replaced by conveyor ovens which cut cooking time almost in half. A typical cook time for fresh medium size pizza (12 to 14 inch) through a conveyor oven is about 7 minutes as compared to 15 minutes in a deck style oven. In addition to the significant cook time reduction, the conveyor also greatly simplified the cooking procedure as the product is automatically loaded and unloaded from the cooking chamber. This eliminated the need for an operator to attend the oven as would be the case for a deck oven, and it eliminated operator error that occurs when a food product is pulled late from a deck or batch type oven.

Conveyor oven systems typically use a continuous open link conveyor belt to carry individual food products through a heated oven tunnel. The oven tunnel has openings through which the respective ends of the conveyor extend sufficiently to make it convenient for operators to start incoming food products on one end of the belt and to retrieve cooked products from the other end. A large conveyor for restaurant applications would have a cook tunnel length of about 70 inches, a belt width of 32 inches, overall length of 106 inches, overall depth of 62 inches, and weigh about 1800 pounds. An all electric version would have a power draw of about 32Kw. A direct fired gas version would have an input of about 170,000 Btu/hr with an electric power need of about 2 ½ Kw. The production rate for a large conveyor oven is about 100 to 120 medium pizzas per hour.

Market feedback indicates that to be successful, pizza chains must offer variety and fast service. By its nature, however, pizza is best cooked to order. For high volume operations pizzas traverse the conveyor ***oven*** in rapid succession. Rapid batch cooking, that is, hot air convection coupled with microwave (in addition radiant energy may be used) cooking is not suitable for this high volume applications. While they can produce a product very quickly, they are not well matched to a high volume pizza operation. Conveyor type ovens offer a much better flow of orders through the kitchen than a battery of combination ovens would permit. In addition, a conveyor is much less labor intensive than staffing for a battery of speed cook ovens. The conveyor format guarantees that a finished product is removed from the oven at the proper time.

Unfortunately, conveyor ovens are not compatible with quick service restaurant(QSR) needs to service customers quickly with a quality product. A rapid cook conveyor oven is very desirable for the QSR market segment. Such a system would need to cook a fresh medium pizza in less than 3 minutes (50% plus cook time reduction) while providing the convenience and production rate of a typical conveyor oven. Decreased cooking time without compromise to quality offers fast food service significant benefits:

(1) Customer satisfaction is actually enhanced by serving individualized orders faster. The limiting time step in producing a made to order product such as pizza is the cook time. Without a significant time reduction from the current 7 minute cook time for a fresh medium pizza, order fulfillment times expected by QSR customers cannot be met.

(2) A significant decrease in cook time would allow a restaurant location to increase the number of customer served by adding a drive-through function, increasing table service turn rates, and enabling a quick walk-in/take out function.

(3) For stores that currently require multiple ovens to meet customer needs, significantly reduced cook times would permit the same collective throughput with fewer ovens, thus decreasing capital outlays.

While the conveyor oven with its air impingement style heat transfer resulted in a significant in reduction in cook time, it has reached its practical limits relative to accelerating the cooking process. Enhancing the surface heat transfer affect by adding steam to the air flow (condensation addition) or radiant energy (e.g., light, infrared) will likely improve the cook times by 15 to 20 %.

Thus, a need exists for improving the design of conventional conveyor ovens to produce high quality cooked food products in much less time (50% or greater time reduction)

To achieve another 50 to 70 % reduction in cook times requires that a portion of the energy used for cooking be delivered internal to the food. This internal heating reduces the need to conduct all of the cooking energy from the surface to the interior. Internal heating is typically accomplished by either RF or microwave radiation. Radio frequency (RF) is not practical for the great variability found in restaurant food products (e.g., food types, irregular distribution and height) which leads to RF burns on the food. Microwave frequency electromagnetic energy is the only practical method for internal heating of the food. Therefore, a practical rapid conveyor oven capable of high speed cooking (while producing a quality product) would need to would use unique combination of microwave energy and forced convection heat transfer to the food. These primary energy needs may be further enhanced by the addition of radiant energy.

For the rapid cook conveyor to be successful it must be:

(1) Food product friendly. Suitable for thick crust pizza should also be able to cook and warm a broad variety of other foods: seafood, Mexican food, hot dogs, sausage, sandwiches, casseroles, biscuits, muffins, etc. This requires a means to control the power flow to the food, a tall tunnel clearance height to accommodate different food profiles, and a

(2) Energy efficient. Energy consumption should be as low as possible, that is, low energy loss from the tunnel ends and very effective heat transfer means used.

(3) Simple and safe to operate. That is the operator need not have to change or adjust the oven for different products and that the unit is simple to clean/maintain

(4) Easily serviced. A simple machine with key components easily accessed

(5) Low Cost. The rapid conveyor oven must have low manufacturing cost potential

INVENTION DISCUSSION:

The objective of this invention is a rapid conveyor oven that meets the above mentioned needs. The general feature of this rapid cook conveyor oven is that it utilizes a least one cooking zone which employs microwave and forced convection to cook or rethermalize the food. As shown in Figure 1, the subject invention is a rapid cook conveyor consisting of

- One or more discrete cooking zones. Each cook zone is comprised of a zone cook oven. The rapid cook conveyor oven then is comprised of one or more separate zone cook ovens.

- A conveyor transport means that feeds or indexes food product through the cook zone(s).

- Convenient product loading and loading zones are located at the tunnel entrance and exit locations. The loading zone in defined by the space between the walls attached to conveyor belt.

- Cooking chambers that can impart microwave and forced convection flow to the food product in a manner that produces uniform convective and microwave heating. A typical cook temperature range would be 375 to 500 F.

- A convective flow and heat source common to the cooking tunnel. The central blower and heat source subsystem would provide pressurized hot air for all cooking chambers.

- Microwave power sources (magnetrons) would distributed to each cooking chamber or zone. As shown in Figure 2, each cook would include 2 magnetrons mounted to waveguides incorporated into to the front and back walls of the cook zone

- Cooking controls that would permit a variety of products to be run sequentially through the cook zones (Figure 3). Basically, each product type would have a unique cook profile which would be accomplished in a sequential format as the product is processed through the cook zones. The indexing conveyor operating rate is fixed, that is, each cook zone holds any product for the same length of time, say, 50 seconds.

Specific features of this invention are described as follows:

(A) Conveyor Transport: Rather than the continuous style conveyor operation (fixed belt speed, say, 10 inches per minute), the rapid cook conveyor uses an indexing motion to move product into, through and out of the cooking tunnel.

(1) The indexing conveyor operating rate is fixed, that is, each cook zone holds any product for the same length of time, say, 50 seconds. For the 50 sec example and 3 cook zones shown in Figure 1, the total cook time is 150 seconds with a total a total process time through the oven of about 160 secs assuming about 2 ½ seconds needed for the index motion.

(2) Indexing motion is characterized as a cycle consisting of a rapid traverse to move the product to the next stage followed by a dwell or cook period. This motion insures that the energy imparted to the food product can be individualized for product. Precise control of the energy applied to the food is essential for high speed cooking that produces a quality product. This particular important if the oven is to cook a variety of products where the cook energy profile must be adjusted as different product enter the tunnel. An example product flow through oven is as follows:

Step 1: Product A is loaded onto cooking zone and cook sittings for the product A are inputted into oven. Control settings are described by product, by zone and by cook events within each zone (number of events, duration of event, and microwave and convection flows by event).

Step 2: Conveyor indexing motion begins with both front and rear tunnel doors opening. The conveyor then indexes forward one cook zone effective length (pitch length) and moves the product to cook zone 1. The tunnel doors closed as the oven conveyor is now stationary

Step 3: With product A now in cook zone 1, the program cook 1 zone energy profile (for A) is executed. For example, for a 50 second conveyor dwell setting, the cook zone 1 profile for product A may be divided into a 25 second event where only 100% microwave energy is applied followed by a 25 second event where 50% microwave energy plus 100% convection flow is applied.

During this period, other products can be placed on the loading zone.

Step 4: At the completion of the dwell period (e.g., 50 seconds), the conveyor begins the next indexing motion by opening the tunnel doors, followed the indexing of one pitch length which moves product A from cook zone 1 to cook zone 2. Product B, in the loading area, would also be indexed to tunnel cook zone 1. Product B's cook profile would be entered into the oven controller. The tunnel doors close when the conveyor comes to rest.

Step 5: With product A now in zone 2 and product B now in zone 1, each product can be cooked with its own zone recipe setting. For example, product A (in zone 2) may require 100% convective input for the 50 second dwell period and product B (in zone 1) may have 3 events programmed into the 50 second dwell (e.g., product B, zone 1 cook events, 15 sec of 100% convective flow, 20 sec of 100% microwave energy, and a final 15 sec of 50% microwave and convection).

Step 6: At the completion of the dwell period (e.g., 50 seconds), the conveyor begins the next indexing motion by opening the tunnel doors, followed by the indexing of one pitch length which moves product A from cook zone 2 to cook zone 3. Product B would be indexed from zone 1 to zone 2. Product C, in the loading area, would also be indexed to tunnel cook zone 1. Product C's cook profile would be entered into the oven controller. The tunnel doors close when the conveyor comes to rest.

Step 7: With product A now in zone 3, product B now in zone 2 and product c in zone 1, each product can be cooked with its own zone recipe setting. For example, product A (in zone 3) may require 100% convective input for the 25 second followed by no convective nor microwave input, product B (in zone 2) may have 2 events programmed into the 50 second dwell (e.g., product B zone 2 cook events 40 sec of 100% microwave, and 10 sec of 70% microwave energy), and product C will have its own zone cooking instructions.

Step 8: At the completion of the dwell period (e.g., 50 seconds), the conveyor begins the next indexing motion by opening the tunnel doors, followed the indexing of one pitch length which moves product A from cook zone 3 to the unloading zone. Product B would be indexed from zone 2 to zone 3. Product C would also be indexed to tunnel cook zone 2. If a Product D is on the loading zone, it will be indexed to cook zone 1 and its profile would be entered into the oven controller. The tunnel doors close when the conveyor comes to rest and this cycle continues.

(3) The indexing motion of the rapid cook conveyor is also very beneficial relative to microwave containment within the cooking tunnel. The conveyor is stationary during the cook thereby permitting the tunnel door to close into the conveyor belt. This is a great advantage as the tunnel ends can be sealed (doors shut) which controls microwave leakage to safe levels and it greatly reduces the end thermal or heat end losses associated with traditional open tunnel ends (hot air leaves the open tunnel ends with cool ambient air rushing in to replace the lost hot air)

(B) Cooking Zones:

(1) The rapid cook conveyor consists one or more discrete cooking zone. The simplest one zone design would process just one product at a time. A multi-zone design of 'n' zones would have up to 'n' products in the oven at a given time.

(2) The total capacity or rapid conveyor throughput (products per hour) is function of the number of cook zones and the total cook time for a product. For example,

(i) A one zone rapid cook conveyor with a 2 ½ Min (150 sec) cook time will process about 24 products per hour

(ii) A three zone product with 50 second zones and a total cook time of 2 ½ minutes (3 X 50 sec) will process about 72 products per hour

(iii) A six zone unit with 25 sec cook zones would process about 144 products per hour. Six zones is approaching a practical limit relative to size, and complexity.

(3) Given that the product is stationary in the cook zones the energy flows imparted to the product can be precisely controlled. Control of energy to the product in a zone includes the means to modulate both the microwave and convective energies that a product sees. Several discrete cooking events would be enabled for any zone.

A stationary product during cooking permits the uniform application of the cooking energies (microwave, convective and optional radiant). In contrast, a typical continuous conveyor has the product passing through convective zones (air impingement fingers) that tends to smear the cooking conditions and makes it impossible to tailor the cooking profile by product.

(C) Zone Cooking or Heating Means

(1) Overview: As shown in Figure 4, the rapid cook conveyor oven cooking zones consist of

(i) A zone oven cavity consisting of a floor, front and back side walls, and a roof

(ii) Each cooking zone has open ends with a conveyor belt placed above and parallel to the cook zone floor

(iii) The cook zones are placed end to end with the conveyor passing through each zone. The zones are separate by a small distance in order to minimize the influence or coupling between zones (e.g., airflow currents, and microwave)

(iv) Airflow is provide to the zones from hot air sources that supply convective airflow to all zones. Figure 4 shows a 2 blower/heat source design with one blower providing the flow required by the zone air ducts located on the front wall/roof of the cook zone and another for the blower for the ducts located on the back wall/roof

(v) Microwave feeds along the cavity walls with one magnetron associated with each side wall of a cook zone

(vi) Equipment bays for housing high voltage microwave circuit components, magnetrons, cooling fans, electronics, line filters, and electrical components located adjacent to each magnetron

(2) *Airflow Circuit*:

(i) The rapid oven cook zone has 4 flow paths used to circulate hot air within the oven cavity. Two paths or flow fields are directed towards the top and sides of the product and two paths are directed at the bottom and sides of the food product.

Two supply ducts convey air to each cook zone oven. Each duct supports both top and bottom flows. This geometry creates an oven chamber that has a continuous floor not interrupted by air ducts or microwave feeds. This eliminates cleaning and maintenance issues associated with existing high speed technology. See Figures 2, 4, and 5

In addition, the cook chamber height can be increased by eliminating ducts and/or jet plates from the floor of the oven.

(ii) Convection air is supplied to the cavity by perforated cavity plates that direct airflow to the top, sides, and bottom of the food product. The forced convection air is introduced into the cooking cavity through the cooking cavity surfaces (e.g., perforated air plates) wherein the cooking cavity surfaces are orientated between the horizontal and vertical planes of the cooking cavity walls.

The highly turbulent flow that results has the following benefits:

- Creating a cook zone airflow that is averaged spatially, or a flow condition that tends to average out the high and lows in flow variation for a given point in the cook cavity greatly reduces the design complexity needed to impose a uniform flow field over a cooking zone.

- Conflicting air flows associated with this "X" style flow field produces both the high heat transfer rates needed for rapid cooking and the average flow conditions over space and time needed to produce uniform cooking/browning.

(iii) Once the air has circulated around the food, it is drawn to the roof of the zone oven cavity for return to the central blower, convection air heating source, and for grease control. The upward return path through the cavity roof opening has several key advantages:

- It enables a conveyor to pass through the cook zones as two ends of cook cavity are now free of any air moving or microwave related subsystems (i.e, no blower return air path or microwave feeds)

- It promotes uniform side browning as the bottom flow is drawn past the product edges as it flows up to the exhaust point on the roof

- It reduces grease loading in the return air stream

(iv) Flow control to the various zones is accomplished via simple air flow dampers or valves and referred to as node points in Figure 5. This approach maintains a relatively constant flow through the oven which eliminates the need for varying the blower speed (cost reduction and less complex).

For the 3 zone example shown in Figure 1, about 300cfm would be required per zone. The volumetric flow rate for each blower would be about 900cfm. This approach produces a hot air flow supply loop (Figure 5) that the several cook zones can draw from as the zone valves or nodes are opened.

Having a relative large flow reservoir for the zones to draw from reduces the flow perturbation that zones would experience with rapid opening and closing of the dampers. Actuation of the valves is accomplished using solenoids or stepper motors. This method

permits the blowers to operate at fixed speeds, and guarantees that sufficient flow is always present for safe reliable operation of the air heating source and grease clean-up system.

(3) *Microwave Circuit:*

(i) A microwave waveguides (with slotted antenna's) are positioned along the front and back cavity walls. The microwave feeds are centered near the rack level [just below the upper air supply duct] such that nearly equal energy is directed towards the top and bottom of the food. See Figure 4.

(ii) Standard 2.45GHz magnetron tubes are used producing a maximum power level for the oven of around 2000 watts (delivered to the food) or 1000 watts per tube. For the 3 zone example, a total microwave power available to the food would be about 6000 W (3 zones, 2 tubes per zone, 1000 W to the food per tube). The power input to the entire microwave system would be about 10kW.

(iii) Matching the general microwave and convection heat transfer energy patterns such that uniform cooking conditions can be achieved on the top and bottom of the food product. This is key to rapid uniform cook over a large food product such as a 14 inch diameter pizza.

(D) **Central Air and Heat Source**: As shown in Figures 2 and 5, the rapid conveyor oven has a central blower and air heating subsystem that provides hot pressurized air to the several cook zones in the oven. This subsystem can be characterized as follows:

(1) Hot pressurized convection air (supply air) is provided to each cook zone within the tunnel via 2 blowers and a single air heat source. Independent blowers are used to provide air to supply ducts that feed the all the front and back convection ducts within each cook zone oven.

(2) After the oven supply passes over the food product and through the cavity, it flows up to the cavity roof where it exits the oven cavity. As the air flows from the zone oven cavity it passes to a common blower return duct that services all cook zone ovens.

(3) A single energy source is used to supply heat to the air returning to the blowers. This approach greatly simplifies the heating system as compared to distributing heat sources among the various cooking zones. A single heat source controller is utilized. High power electrical wiring or natural gas line connections are also centralized. For a gas fired heating kit, only a single burner and ignition module are needed. Both oven construction and maintenance are reduced.

Convection heat source power requirements per cook zone would be between 5 and 7 kW for the electric kit or 24 to 34 kBtu/h for a direct fired natural gas powered heater. For the 3 zone example, an electric heater would be sized between 15 and 21 kW while the gas fired air heater would have a 72 to 102 kBtu/h need. For either power source, a standard temperature controller could be employed (i.e., maintaining the blower discharge temperature).

(4) The air heater location is ideal for a gas fired air heater relative to ease of installation, service, and its ability to incinerate grease particles that come in contact with the very hot products of combustion. Of course, the hot products of combustion are mixed with the oven air returning to the blower resulting in a modest air temperature increase of between 20 to 60F. A number of combustor types are suitable for this application including surface type burner.

(E) **Grease Control**: Rapid cook ovens generate a higher grease load in the oven air given that the cook cycle is very short and that the total amount of grease generated during a conventional and rapid cook is about the same. To prevent excessive grease build-up in the oven, a means to remove grease for the convection air is incorporated into the rapid cook tunnel oven. Grease control is accomplished by one or more of the following means:

(1) Immediately after the exits the cook zone cavity it passes through a grease control element mounted in the region of the cavity roof. This element mechanically separates the grease particles greater than 3.0 microns from the airflow. The roof location makes it ease to install and service such an element as front access can be provided.

[note: The conflicting/glancing style of air flow incorporated in this invention produces a flow field where grease entrainment is reduced as compared to the typical conveyor oven using vertical impingement style flow. The classic impingement approach tends to throw or kick grease into the air stream from both the pan and food product.]

(2) By extracting the larger grease particles at the source (cook zone), managing grease build-up in the down stream ducts and heater area is much simplified. However, an additional level of grease control may be needed (depending on products to be prepared) to minimize grease build-up in the blower and supply duct areas. The blower wheel acts much like a centrifugal separator and will separate and coalesce the small grease particles in the blower scroll area and discharge larger particles into the supply area. To control this effect, a catalyst material (e.g., corrugated foil coated with catalyst, or catalyst coated screens) is placed up stream of the blower inlet. The catalyst acts to combust(oxidize) the small grease particles and grease vapor.

Larger conveyor ovens are fitted with an exhaust hood system that controls both heat gain to the kitchen space and eliminates grease laden air from the kitchen. As such, the exhaust hood is design to handle grease laden air requiring a number of safety features including fire suppression, welded exhaust ducts (Type 1 duct), and a fire rated chase. The above mentioned clean-up kit would greatly reduce problems associated with the exhaust of greasy exhaust air.

(F) **Microwave Isolation to the Tunnel:** Given that the rapid cook conveyor oven is a hybrid oven which incorporates microwave heating, the need to isolate the microwave energy within the cooking tunnel is absolutely essential. In the United States, the FDA has established very strict microwave leakage levels for an oven (e.g., 1 mW/cm**2 for a new unit at the factory). In the past, conveyors that incorporated microwave power used long entrance and exit tunnels to attenuate the microwave leakage escaping from the open tunnel ends. These long tunnels not only require much additional floor space, but they work for throat heights of only a few inches. Such a short throat height greatly limits products (e.g., sub sandwich) that can pass through such a conveyor unit. This invention eliminates the need for long entrance/exit tunnels and short tunnel height relative to controlling microwave leakage by employing the indexing conveyor approach coupled with tunnel doors (see Fig 1,6) and it is described as follows:

(1) The indexing motion as described above permits the conveyor to come a stop during the cooking cycle. As such doors can be closed at the open tunnel ends during the cook. Utilizing doors eliminates the need for the long entrance and exit tunnels and it eliminates the need for oven entrance height of only a few inches. The rapid cook conveyor can easily handle products that are greatly than 6 inches tall. This covers the vast majority of products that would be cooked via the rapid cook conveyor in a quick service restaurant or a fast causal restaurant format.

(2) As shown in Figure 6, when the conveyor is at rest during the cook cycle, the door must close around the conveyor belt. To form a tight microwave seal between belt and the door, an interface wall is added to the belt. Rather than the door closing on an irregular belt surface, the door closes around a uniform structure. The wall spacing on the belt correspond to the pitch length (cavity centerline to

cavity centerline) described in the above mentioned " Step 8." The space between the partitions or walls also defines the 'landing zone" for product loading.

(3) The door/wall microwave interface configuration between the movable door and the short wall on the belt is such that neither precise belt motion control (stopping at an exact location) nor metal to metal contact between the door edge and the wall are required. The wall/belt design is axially compliant. In addition, a ¼ wavelength choke is integrated into the bottom edge of the doors. Allowing for small displacement of the wall when the door closes is accomplish by the combination of the inverted "V" shape which guides the two elements together and by a compliant (not rigid) connection of the wall to the belt. The inverted "V" shape has sufficient length to support a ¼ wavelength choke (about 1.2 inches).

(G) Controls: To achieve rapid cooking, each product processed by the rapid cook conveyor oven has a unique recipe. Given that the rapid cook conveyor will be cooking several products at given time (each located in a different cook zone), the oven controls must track the cook products as they move through the several cook zones adjusting the zone microwave and convective energies. The rapid cooking conveyor has three distinct control features which are

(1) User interface- Given the possible complexity of the product cook recipes and the need to minimize labor content associated with loading a product onto the belt, an automated product identification feature is utilized. As the crew member places the food product on the loading zone, a unique product identification code is transferred to the oven controller eliminating manual control inputs. This information is used to select the correct recipe settings for the product to be cooked. Transfer of information would be accomplished using an RFID tag placed on the food by the crew member. The RFID tag would be programmed from the restaurant POS system and read (wireless link) by the oven controller. This approach also minimizes error associated with a crew member imputing an incorrect oven control setting and it allows the restaurant to optimize customer service as the oven controller communicates to the POS system when the product will be done.

(2) Conveyor Speed – To reduce the controls complexity, the oven conveyor speed is operated at a fixed rate. This approach establishes fixed times (dwell) that the product remains in a given cook zone. In addition to simplifying food recipe development and control algorithms, it also reduces the complexity of the conveyor drive mechanism resulting in a less expensive and more robust product

(3) Oven Control- As discussed earlier, the recipe setting "follow" the product as it mores through the several cook zones. Each cook zone control settings are updated to match the recipe settings for the product in that particular zone.

I claim an apparatus having all of the features shown in FIGURES 1-6.

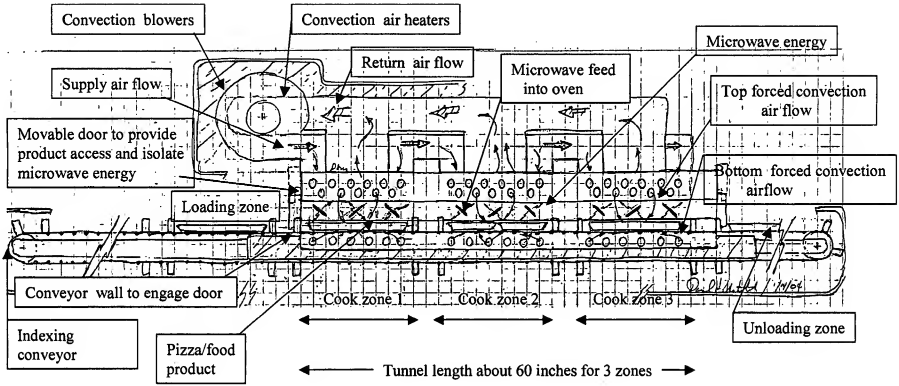

Fig 1 -- Speed Cooking Conveyor Oven
Side View

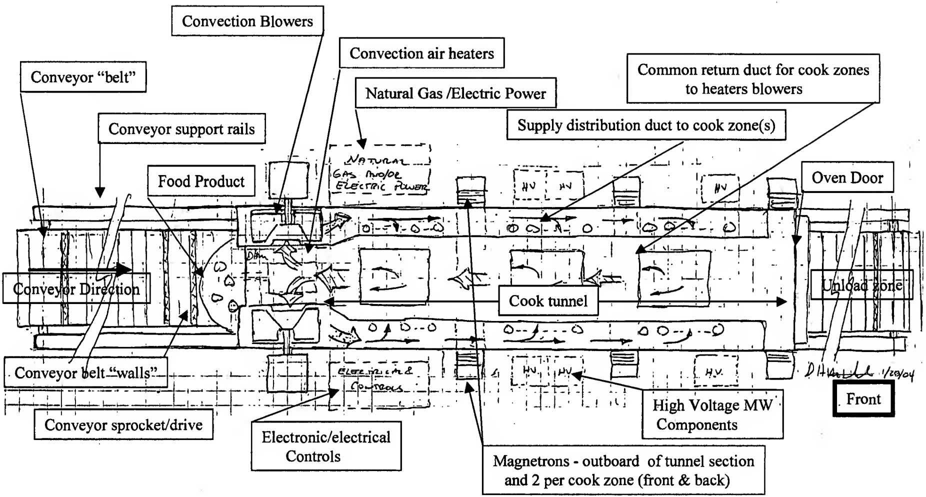

Figure 2 - Top View of Speed Cook Conveyor

Invention Disclosure for a Rapid Cook Conveyor Oven
by D. McFadden

Global Appliance Technologies, Inc

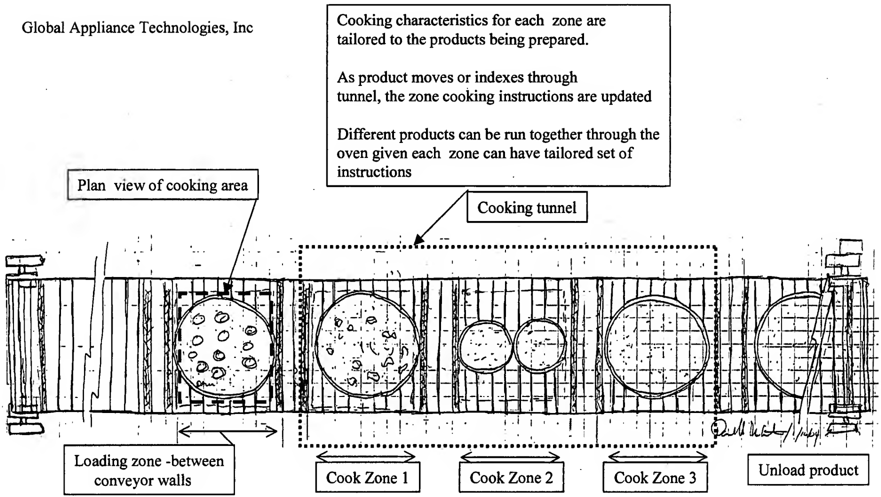

Figure 3 - Top view of product location relative to cook zones

Invention Disclosure for a Rapid Cook Conveyor Oven
by D. McFadden

Global Appliance Technologies, Inc

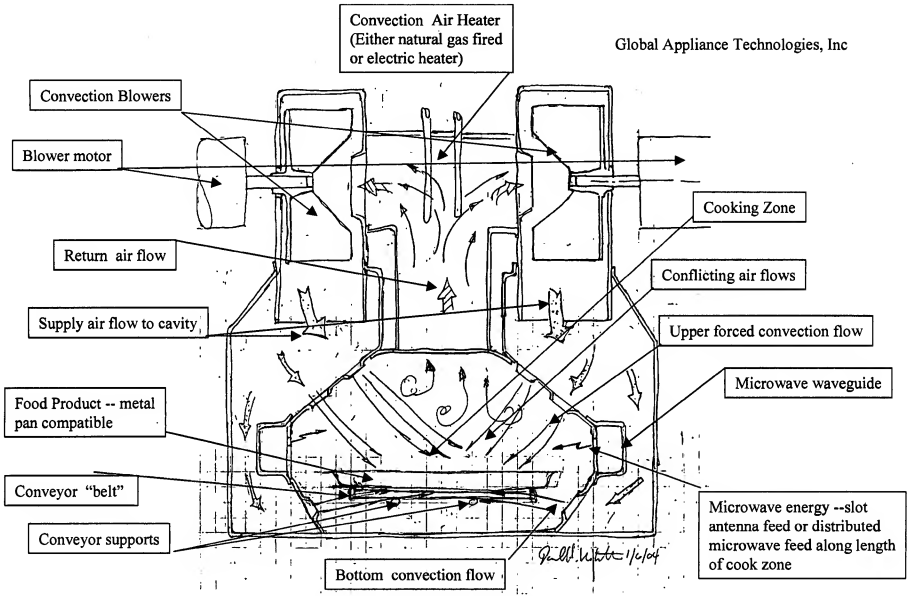

Figure 4- End View of Cooking Tunnel

Invention Disclosure for a Rapid Cook Conveyor Oven
by D. McFadden

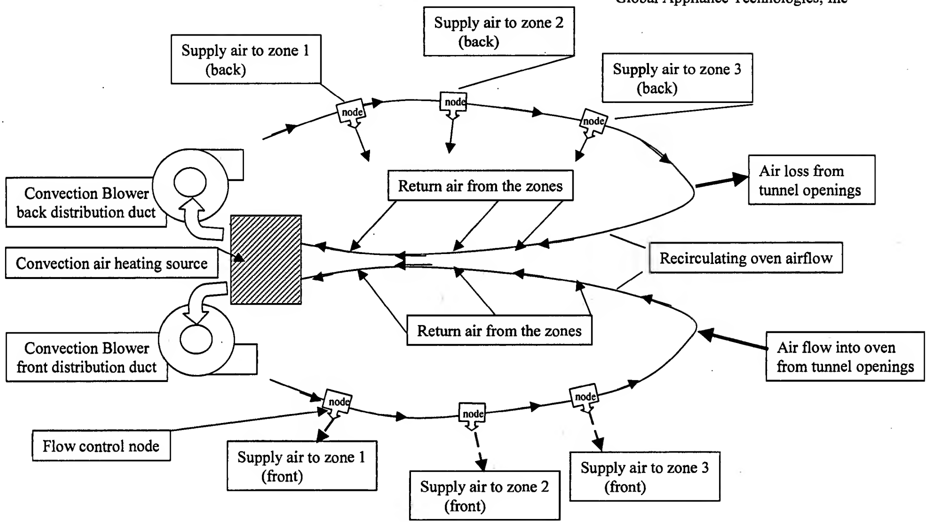

Figure 5 --Conveyor convection air flow schematic

Invention Disclosure for a Rapid Cook Conveyor Oven
by D. McFadden

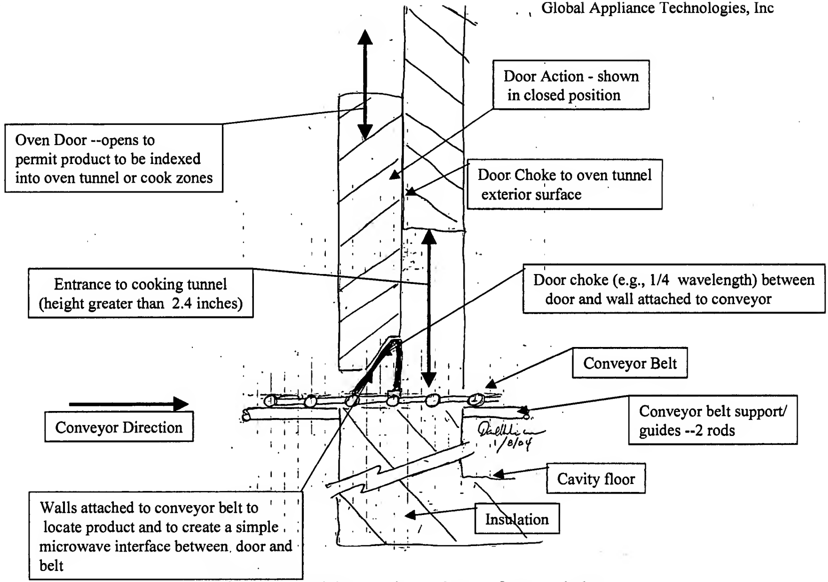

Figure 6 -Side section view of tunnel door

Invention Disclosure for a Rapid Cook Conveyor Oven
by D. McFadden

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of: **DAVID H. McFADDEN**

Serial Number: **TO BE ASSIGNED**

Filed: **5 March 2004**

For: **SPEED COOKING CONVEYOR OVEN**

ASSERTION OF ENTITLEMENT TO SMALL ENTITY STATUS
UNDER 37 C.F.R. §1.27 (c)

Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

Sir:

Pursuant to 37 C.F.R. 1.27 (2) (c) (i), the undersigned hereby asserts that **GLOBAL APPLIANCE TECHNOLOGIES, INC.** owner by assignment of the entire right, title, and interest in the subject application, is a small entity as defined in 37 C.F.R. § 1.9(d) and is entitled to small entity status for purposes of paying reduced fees under Section 41 (a) and (b) of Title 35, United States Code, to the Patent and Trademark Office with regard to the subject invention.

EXPRESS MAIL NO. ER 715489448 US
I hereby certify that this paper or fee is being deposited with the United States Postal Service as Express Mail "Post Office to Addressee" service under 37 C.F.R. § 1.10 on the date indicated below and is addressed to Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450.
Date of Deposit: March 5, 2004
By: [signature]

Respectfully submitted,

March 5, 2004
Date

David A. Bolton
Reg. No. 41627
1103 Concord Avenue
Southlake, Texas 76092
(817) 821-3956 (voice)
(817) 421-3431 (facsimile)
dbolton@globalappliancetechnologies.com (e-mail)

ATTORNEY FOR APPLICANT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of: **DAVID H. McFADDEN**

Serial Number: **TO BE ASSIGNED**

Filed: **5 March 2004**

For: **SPEED COOKING CONVEYOR OVEN**

CERTIFICATION UNDER 35 USC SECTION 122(b)(2)(B)(i) OF NO FOREIGN FILINGS

Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

Sir:

Applicant hereby certifies (through counsel) that the invention disclosed in the above-identified application filed herewith has not, and will not, be the subject of an application filed in another country, or under a multi-lateral international agreement, that requires publication of applications eighteen (18) months after filing; therefore Applicant requests that the subject application not be published under 35 USC Section 122(b)(1).

EXPRESS MAIL NO. ER 715489448 US
I hereby certify that this paper or fee is being deposited with the United States Postal Service as Express Mail "Post Office to Addressee" service under 37 C.F.R. § 1.10 on the date indicated below and is addressed to Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450.
Date of Deposit: March 5, 2004
By: [signature]

Respectfully submitted,

March 5, 2004
Date

David A. Bolton
Reg. No. 41627
1103 Concord Avenue
Southlake, Texas 76092
(817) 821-3956 (voice)
(817) 421-3431 (facsimile)
dbolton@globalappliancetechnologies.com (e-mail)

ATTORNEY FOR APPLICANT